

SUPPORT FOR THE AMENDMENT

This Amendment cancels Claim 47; and amends Claims 11 and 48. Support for the amendments is found in the specification and claims as originally filed. In particular, support for Claim 11 is found in canceled Claim 47 and in the specification at least at page 4, line 10. No new matter would be introduced by entry of these amendments.

Upon entry of these amendments, Claims 11-14, 43-46 and 48 will be pending in this application. Claim 11 is independent.

REQUEST FOR RECONSIDERATION

Applicants respectfully request entry of the foregoing and reexamination and reconsideration of the application, as amended, in light of the remarks that follow.

The present invention provides a hard-drawn steel wire allowing springs made of the wire to exhibit excellent fatigue strength and sag resistance even without subjecting a drawn wire to quenching and tempering treatments. Specification at page 1, lines 7-9. The hard-drawn wire consists of ferrite and/or pearlite, contains C in an amount of 0.5 - 0.68 mass%, and comprises 5 particles/100 μm^2 or less of carbides wherein the circle-equivalent diameters of the carbides are 0.1 μm or more. The C content of 0.68 mass% or less inhibits fracture in performing works and the occurrence of cracks that deteriorate fatigue life. Specification at page 4, lines 4-6. The limited number of large carbides in the hard-drawn wire, which consists of ferrite and/or pearlite, provides improved fatigue strength and sag resistance equal or superior to that of an oil-tempered wire consisting of tempered martensite generated by the quenching and tempering treatment. Specification at page 2, lines 13-16; page 3, lines 15-25.

Claims 12-14 and 44-46 are rejected under 35 U.S.C. §103(a) over Japanese Patent No. 7-90495 ("JP-495") and further in view of Japanese Patent No. 405320827 ("JP-827"). In addition, Claims 11-14 and 43-46 are rejected under 35 U.S.C. §103(a) over U.S. Patent

No. 6,224,686 ("Aoki") or U.S. Patent No. 5,904,787 ("Matsumoto") alone or in view of JP-495. However, Claim 47 is not rejected over the cited prior art. Claim 47 is canceled and incorporated into independent Claim 11. Thus, the rejections under 35 U.S.C. §103(a) should be withdrawn.

Claims 11, 43 and 47 are rejected under 35 U.S.C. §103(a) over JP-495.

JP-495 discloses a steel wire containing 0.7-1.0 wt% C and 0.05-1.0 vol% of carbide of V or Nb having a size of 0.1 μm or less. JP-495 discloses that C less than 0.7 wt% causes deterioration of strength (JP-495 at column 2, line 40) and the size of carbide of V or Nb more than 0.1 μm impairs workability (JP-495 at column 3, lines 10-11).

However, JP-495 fails to suggest the independent Claim 11 limitation of "C: 0.5-0.68 mass%" and "5 particles/100 μm^2 or less of carbides wherein the circle-equivalent diameters of the carbides are 0.1 μm or more". As discussed above, in the hard-drawn steel wire of the present invention the C content of 0.68 mass% or less inhibits fracture in performing works and the occurrence of cracks that deteriorate fatigue life. Specification at page 4, lines 4-6.

Because JP-495 fails to suggest all of the limitations of independent Claim 11, the rejection over JP-495 should be withdrawn.

Furthermore, since the steel wire of JP-827 is subjected to a quenching and tempering treatment after a drawing treatment (see [0011], [0013] and [0037]), this makes it difficult to combine the steel wire of JP-827 with that of JP-495 having pearlite structure which is not subjected to such a quenching and tempering treatment.

Aoki and Matsumoto disclose an oil-tempered wire containing specific elements and a limited number per unit area of carbides having a certain size (cf. claims 1).

The oil-tempered wire is a quenched and tempered wire having the tempered martensite structure which is generated by such a quenching and tempering treatment, as

disclosed in Aoki at column 3, lines 1-3. The tempered martensite structure per se provides excellent fatigue strength and sag resistance. Specification at page 1, lines 16-23.

In contrast, the hard-drawn wire of the present invention, which is not subjected to the quenching and tempering treatment, consists of ferrite and/or pearlite structure, and therefore has relatively lower fatigue strength and sag resistance compared to the oil-tempered wire (cf. page 1, line 24 to page 2, line 4). Despite this, the present hard-drawn wire achieves fatigue strength and sag resistance equal or superior to the oil-tempered wire consisting of tempered martensite.

Here, the oil-tempered wire of Aoki or Matsumoto contains 5 pieces/ μm^2 (500 pieces/ $100\ \mu\text{m}^2$) or less of carbides having the size of $0.05\ \mu\text{m}$ or more. In contrast, the present hard-drawn wire restricts the number of carbides having the larger size of $0.1\ \mu\text{m}$ or more (2 times or more in diameter and 4 times or more in area) to 5 particles/ $100\mu\text{m}^2$ or less (1/100 or less) compared to those of the oil-tempered wire of Aoki or Matsumoto.

Namely, the oil-tempered wire of Aoki or Matsumoto, of which martensite structure per se has excellent fatigue strength and sag resistance, is able to fulfill the wire properties if it contains 100 times or more of carbides having the area of $1/4$ or smaller. In contrast, the present hard-drawn wire consisting of ferrite and/or pearlite structure, which is in situ inferior to the oil-tempered wire, achieves a remarkable increase in fatigue strength and sag resistance by restricting the number of carbides having the area of 4 times or more to 1/100 or less.

Such effect of the present hard-drawn wire consisting of the ferrite and/or pearlite structure would be unexpected from the oil-tempered wire of Aoki or Matsumoto consisting of the tempered martensite structure.

In view of the foregoing amendments and remarks, Applicants respectfully submit that the application is in condition for allowance. Applicants respectfully request favorable consideration and prompt allowance of the application.

Should the Examiner believe that anything further is necessary in order to place the application in even better condition for allowance, the Examiner is invited to contact Applicants' undersigned attorney at the telephone number listed below.

Respectfully submitted,

Customer Number
22850

Tel: (703) 413-3000
Fax: (703) 413 -2220
(OSMMN 03/06)
CPU/rac

OBLON, SPIVAK, McCLELLAND,
MAIER & NEUSTADT, P.C.
Norman F. Oblon

A handwritten signature in cursive script, reading "Corwin Paul Umbach".

Corwin P. Umbach, Ph.D.
Registration No. 40,211